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department. Emphasis should be placed on the broadest theoretical training. The holder of the fellowship should be free (not under contract) at the end of his period of study.

"(6) In passing on candidates for the degree of Ph.D., emphasis should be put on a thorough training in the fundamental principles of chemistry and upon high attainment in research, rather than upon period of study."

This is the present opinion on the question. Whether time will modify it we can not tell, but the suggestions outlined above, if rigorously carried out, will tend to bring about a closer cooperation between chemical science and industry than now exists.

WALTER H. COOLIDGE

CENTRE COLLEGE,
DANVILLE, KENTUCKY

ANTHROPOLOGY IN THE MEDICAL CURRICULUM

THE problem of human types is one that has baffled the ages, but it is at present in a fair way toward solution. The temperaments as depicted by Albrecht Dürer in the forms of four apostles, and as taught at the School of Salerno, based upon the four elements and upon the four humors of Hippocrates, and known as the melancholic, choleric, phlegmatic and sanguine, may not be generally accepted, and the phthisical and plethoric may have a greater significance, but until the physical and psychical types are studied upon a more exact and scientific basis the types of man may remain as myths to the laity as well as to the medical profession.

Manouvrier was the first to place the types of man as found among the Europeans upon an exact basis by actual measurement, and his classification into brachyskele, mesatyskele and macroskele, or broad, medium and long skeleton, is working its way into medicine. Godin has applied the methods of Manouvrier to children in the evaluation of growth with illuminating results. Others have utilized the same methods in the differentiation of races and in the segregation of types within the race.

The best means of differentiating human

types is by anthropometry and inspection. The type may be decided by a careful inspection of the external form of the ear, nose, face, head and body form after one has become familiar with the types by prolonged experience. It is possible by the ear form alone to determine differences of 10 feet in the length of the small intestine, of 500 grams in the weight of the liver, of differences in the size of the brain, cerebellum, heart, kidneys and spleen, of the position and shape of the viscera; thus anthropology becomes the handmaid of anatomy in the medical curriculum, an essential adjunct in teaching medicine. Different human types represent different forms of intellect and different immunities and susceptibilities to disease, hence psychology and pathology become associated with anatomy and anthropology.

Adult human types probably represent the end products of chemical reactions that have been continuously at work throughout the life of the individual, or at least a large part of the life. It is only fair to assume that the net result of this activity will be easier to perceive than the chemical reaction at any particular moment. It may be fruitless to attempt to determine or differentiate chemical types, although the serum reactions may be so delicate that they will suffice to make clear minute differences.

Such a piece of work as that published in *L'Anthropologie* by Dr. L. and Madame H. Hirschfeld may interest physiologists, pathologists and internists. Serum tests were made during the Great War on about 500 soldiers in each of many national groups of Europe, of Asia and of Africa, and differences were found that amounted to more than 50 per cent. The tests were so acute and positive that individual heredity could be determined, the parentage of any child verified.

Dr. Goldthwait, in the Shattuck Lecture for 1915, presents the types of man as a basis for diagnosis and treatment, as do Percy Brown and Bryant. There is also an editorial in the number of the *Boston Medical and Surgical Journal* which has the Shattuck Lecture, wherein, with prophetic vision, the editor

states that some medical school will give a course in anatomy based upon human types, others will follow until the custom becomes universal. This has been done for the past ten years by the writer at Tulane or Virginia, and at both Western Reserve and Washington University, St. Louis, anthropology is a part of the medical curriculum in anatomy.

Human types have been studied in relation to medicine until physicians and surgeons are becoming familiar with their varied manifestations. Bryant, following Treves and others, calls the types carnivorous and herbivorous, as determined by the functions of the alimentary canal and diet. Chaillon divides the types into four from the physiological and clinical standpoint: digestive, respiratory, muscular and cerebral. Mills has two types of visceral form as determined through the X-ray by position, tonus and motility: asthenic and hypersthenic, each with subdivisions. It is not difficult to see the differences between the carnivorous and herbivorous types of Bryant, Treves and others; between the narrowback and broadback of Goldthwait; between the longskeleton and broadskeleton of Manouvrier; between the cerebral and digestive of Chaillon; between the asthenic and the hypersthenic of Mills; and between the hyperphyломorph and mesophyломorph of Bean; and it may be easy to demonstrate that all the couples are practically the same; but the psychologist, the physiologist and the pathologist must associate or dissociate the mental, the functional, the pathological and the physical.

The clinician may ultimately become familiar with human types by a process of assimilation through experience, but the necessity for the teaching of both race and type differences to medical students becomes more and more imperative. The proper place for the teaching of these subjects is in a laboratory of physical anthropology as a part of the medical course. At the beginning short practical courses in anthropometry and methods of inspection may be offered as optional work in connection with gross anatomy until such time as more complete courses may be given which should ultimately be offered as required work

in a department of anthropology on a par with the courses in physiology, pathology or anatomy.

The physical and the psychical sides of man in relation to diagnosis, prognosis and treatment have been too much neglected in the medical curriculum, due in part to the enormous exacerbation of interest in germ diseases following the brilliant studies of Pasteur as to the rôle of bacteria in the production of disease. It is unnecessary to entail a discussion of the varying share of incitor and host in the production of disease, or upon the degree of immunity or susceptibility of the individual due to the physical or mental type or state. Once recognize the equal importance of the man and the germ, once understand the full value of the physical and psychical type and state, then follows as night the day the introduction of departments of anthropology and psychology into the medical curriculum.

Furthermore there are constitutional diseases, diseases of the blood and nervous system, and disorders of the mind not due to animal or vegetable parasites or germs of any kind, that need to be studied in relation to the physical and psychical type and state. The application of such knowledge is a field for the future in medicine.

Another field in which anthropology is potent is in that of growth. There is great need for studies in growth of races and of types, although Godin has blazed the trail in that direction, and these studies should lead the medical student to a thorough knowledge of the laws of growth, of the curves of growth of the organs, of the long bones, of the teeth and of the parts and structures of the body. A knowledge of the critical periods in the growth of structures is vital in medicine. This should be taught from the standpoint of race, and of type within the race.

We can not hope that anthropology will come into its own immediately as a separate department in the medical curriculum, which is already overcrowded, but let us hope that the study of the types of man will be pursued diligently in many directions, and that a place and time will be found in the medical curricu-

lum ultimately as the need and demand become imperative through the diffusion of knowledge.

R. BENNETT BEAN

UNIVERSITY OF VIRGINIA

SCIENTIFIC EVENTS

THE FILM PHOTOPHONE ¹

THE announcement in the *Times* of September 24 of the successful synchronization of speech and action in cinematography by means of photographic films bearing suitable sound records is the natural outcome of the work expended on this problem in numerous different countries. Sweden, through MM. Bergland and Frestadius, has apparently been fortunate enough to reach success first. It is indeed surprising that the achievement has been so long delayed. Speaking-films, apart from synchronization, have been in existence for a long time, having been first made by Ernst Rühmer about 1900, and called by him the "photographophone." Rühmer made his films by photographing upon them the fluctuating light proceeding from a "speaking arc," and the reproduction was effected by making use of the well-known property of selenium of controlling a telephonic current when actuated by variable illumination. More recently Professor A. O. Rankine has made speaking-films by a different method, in which the voice imposes fluctuations of intensity on a beam of light issuing from a constant source, the reproduction from the film record again being by means of selenium. The whole problem is closely related to telephony by light. In photo-telephony the speech is transmitted by light and reproduced immediately; in speaking-films a photographic record is made for future reproduction. The *Times* article does not make quite clear by what process M. Bergland makes the sound-film, but it probably does not differ fundamentally from those previously used. The novelty of M. Bergland's work appears to be the successful realization of synchronism between the picture-bearing and the sound-record-bearing films. This has been done by the obvious

method of running the two films on the same shaft, both during the taking of the double record of action and speech and during reproduction. In addition, sufficient valve amplification to actuate a loud-speaking telephone has been successfully applied to the selenium-controlled currents.

RADIUM FOR ENGLAND

DR. FREDERICK SODDY, professor of chemistry in Oxford University, travelling as a King's Messenger, has arrived in London from Prague, bringing with him the largest quantity of radium, valued at about £70,000, ever brought into England. The consignment consists of two grams and is the first to be received under the terms of the recent agreement between the Imperial and Foreign Corporation of London and the Czecho-Slovakia Government. The radium was deposited at the Foreign Office and will remain there for the time being, its exact future, according to Professor Soddy, being a matter for negotiation.

Professor Soddy is reported in the *London Times* from which we obtain this information to have said that while on holiday with his wife in Czecho-Slovakia he visited the Joachimsthal mines and was given every facility for inspecting them and the various processes by which the radium was extracted from the uranium obtained in the mines. The agreement mentioned above having been concluded, he was asked by the Corporation, to whom he is the expert scientific adviser, to make arrangements for the transport of the radium to England, a task of considerable responsibility and some danger, in view of its malignant penetrative properties. The two grams were distributed in nine glass phials, packed in a lead case 3 in. thick and weighing about 70 lb. This was contained in an ordinary Foreign Office dispatch-bag, which was finally sealed by an official of the Czecho-Slovakia Government.

"I am sure," Professor Soddy added, "that this radium will be an enormous help to British science and medicine. It is of exceptionally pure quality. The cry of the

¹ From *Nature*.